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# GREAT WHITE SHARK BYCATCH REDUCTION PROBLEMS IN THE CALIFORNIA/OREGON DRIFT GILLNET FISHERY

ANDREW J. GRAF\*

## I. INTRODUCTION

A ten-foot juvenile great white shark glides south along the California Current toward the warm waters of the Southern California Bight, a region of concave coastline extending from Point Conception, California, to the United States-Mexico border. The white shark enters one of its favorite foraging spots, containing a veritable smorgasbord of delicious prey. As the white shark pursues one of its chosen meals—a broadbill swordfish—it suddenly finds itself trapped in a deadly tangle of nylon fibers.

This juvenile great white shark was not the intended target of this particular net. Rather, it was captured by a legal drift gillnet fishery using panels of mesh netting suspended from floats, designed to catch thresher sharks and swordfish.<sup>1</sup> This shark is not alone. Millions of pounds of other non-target species, including fish, turtles, birds, and mammals, are caught in drift gillnets or by other legal fishing methods each year.<sup>2</sup>

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<sup>1</sup> *California/Oregon Drift Gillnet Fishery*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., OFFICE OF SCI. & TECH., [www.st.nmfs.noaa.gov/observer-home/regions/westcoast/driftnet](http://www.st.nmfs.noaa.gov/observer-home/regions/westcoast/driftnet) (last visited Apr. 10, 2013).

<sup>2</sup> NAT'L MARINE FISHERIES SERV., U.S. DEP'T OF COMMERCE, U.S. NATIONAL BYCATCH REPORT 8 (William A. Karp et al. eds., 2011), *available at* [www.nmfs.noaa.gov/by\\_catch/National\\_Bycatch\\_Report/2011/2011\\_National\\_Bycatch\\_Report.pdf](http://www.nmfs.noaa.gov/by_catch/National_Bycatch_Report/2011/2011_National_Bycatch_Report.pdf) [hereinafter *National Bycatch Report*].

Commercial gillnet fishing presents a significant threat to the great white shark population.<sup>3</sup> In fact, a substantial portion of northeastern Pacific white shark mortality is linked to the California/Oregon Drift Gillnet Fishery (Fishery).<sup>4</sup> This fishery is one of three gillnet fisheries on the West Coast that, together, account for eighty-one percent of reported white shark captures.<sup>5</sup> These gillnet fishing vessels are not specifically targeting white sharks; rather, the sharks are caught incidentally, as bycatch.<sup>6</sup> “Bycatch” is defined by the National Marine Fisheries Service (Fisheries Service) “as discarded catch of any living marine resource and as unobserved mortality due to a direct encounter with fishing gear.”<sup>7</sup>

Although precise population size is difficult to establish with certainty, data on global great white shark populations suggests anywhere between a sixty and ninety percent reduction in the number of white sharks in the last fifty years.<sup>8</sup> Of notable concern is the threat of extinction of the northeastern Pacific white shark population, a distinct population segment whose essential habitat is along the coasts of California, Oregon, and Washington.<sup>9</sup> In September 2012, the Fisheries Service initiated a twelve-month review to consider whether the northeastern Pacific white shark population should be listed as a threatened or endangered species under the Endangered Species Act (ESA) based on recent scientific information indicating that the northeastern Pacific white shark population is reaching dangerously low numbers.<sup>10</sup> Similarly, in February 2013, California’s Fish and Game Commission designated the northeastern Pacific white shark as a candidate for state protection under the California ESA.<sup>11</sup>

Although the northeastern Pacific white shark is currently a candidate species awaiting determination, the species is not yet afforded

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<sup>3</sup> GEOFF SHESTER ET AL., CTR. FOR BIOLOGICAL DIVERSITY, OCEANA, SHARK STEWARDS, PETITION TO LIST THE NORTHEASTERN PACIFIC POPULATION OF WHITE SHARK (*CARCHARODON CARCHARIAS*) AS THREATENED OR ENDANGERED 34 (2012), available at [oceana.org/sites/default/files/reports/Oceana\\_NEPwhitesharkESApetition\\_8\\_10\\_12\\_final.pdf](http://oceana.org/sites/default/files/reports/Oceana_NEPwhitesharkESApetition_8_10_12_final.pdf).

<sup>4</sup> *Id.*

<sup>5</sup> *Id.*

<sup>6</sup> *Id.*

<sup>7</sup> NATIONAL BYCATCH REPORT, *supra* note 2, at 3 (footnote omitted).

<sup>8</sup> WILDEARTH GUARDIANS, PETITION TO LIST THE NORTHEASTERN PACIFIC OCEAN DISTINCT POPULATION SEGMENT OF GREAT WHITE SHARK (*CARCHARODON CARCHARIAS*) UNDER THE U.S. ENDANGERED SPECIES ACT 15 (2012), available at [swr.nmfs.noaa.gov/gws/WildEarth\\_Guardian\\_Great\\_White\\_Shark\\_Petition.pdf](http://swr.nmfs.noaa.gov/gws/WildEarth_Guardian_Great_White_Shark_Petition.pdf).

<sup>9</sup> See SHESTER ET AL., *supra* note 3; see also WILDEARTH GUARDIANS, *supra* note 8.

<sup>10</sup> Endangered and Threatened Wildlife; 90-Day Finding on Petitions To List the Northeastern Pacific Ocean Distinct Population Segment of Great White Shark as Threatened or Endangered Under the Endangered Species Act, 77 Fed. Reg. 59,582 (Sept. 28, 2012).

<sup>11</sup> See Laila Kearney, *Great White Shark Proposed for Endangered Listing in California*, REUTERS, Feb. 7, 2013.

protection under either statute. However, other laws and regulations are currently in place to protect the white shark species from the threat of bycatch. For example, the Magnuson-Stevens Fishery Conservation and Management Act (Act) and the Highly Migratory Species Fishery Management Plan (Plan) have both been implemented to protect species not only from direct overfishing, but from bycatch as well.

Despite intentions, the current federal laws and regulations do not provide the white shark adequate protection because of two distinct issues. First, the laws and existing regulatory mechanisms designed to protect white sharks from being caught as bycatch are woefully inadequate. Second, the insufficiency of data regarding the true population size of the northeastern Pacific white shark, as well as the questionable accuracy and reliability of the species' bycatch estimates, limit the potential for a viable solution.

Part I of this Comment explores the problems of great white shark bycatch by examining the white shark's susceptibility to bycatch and the Fishery responsible for a significant portion of white shark bycatch. Part II discusses the federal statutes and regulations applicable to bycatch and the Fishery. Part III provides recommendations for reducing white shark bycatch in the future by modifying current federal statutes, amending existing regulations, and increasing research efforts.

## II. THE PROBLEMS OF WHITE SHARK BYCATCH

### A. GREAT WHITE SHARK SUSCEPTIBILITY

*Carcharodon carcharias*, more commonly known as the "great white shark," "white shark," or "pointer" (hereinafter referred to as the "white shark") is especially vulnerable as bycatch in fisheries because of its behavior and biology.<sup>12</sup> In United States waters, specifically in the waters off California, the white shark's distinctive coastal aggregation habits and innate curiosity heighten its susceptibility to the dangers of commercial gillnet fishing.<sup>13</sup> Additionally, white sharks are particularly vulnerable to fisheries in general due to the species' inherent low abundance, low fecundity, slow growth, late maturity, and high mortality rates of juveniles in the first year.<sup>14</sup>

White shark tracking efforts have significantly improved the understanding of local movements and long-distance migrations of the

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<sup>12</sup> SHESTER ET AL., *supra* note 3, at 7.

<sup>13</sup> *Id.* at 33.

<sup>14</sup> *Id.* at 34.

species.<sup>15</sup> White shark abundance varies seasonally and geographically, although they are encountered over a large portion of the Pacific coast year round.<sup>16</sup> Researchers have found that juvenile white sharks often remain within longer stretches of coastal waters for months, whereas mature adults typically undertake long migrations offshore, away from seasonal coastal feeding sites.<sup>17</sup> This makes juvenile white sharks particularly vulnerable to gillnet fishing vessels.

Northeastern Pacific white sharks are frequently found in the Southern California Bight because of the coastal waters' importance as foraging and nursery areas.<sup>18</sup> This region, extending roughly 200 kilometers offshore from the coast, encompasses various islands, shallow basins, and troughs.<sup>19</sup> In this region, both pregnant females and juvenile white sharks have been incidentally caught by a number of fishing gear types, primarily gillnets.<sup>20</sup>

Although historical abundance remains unknown, combined estimates from white shark aggregation sites off the California coast and near Guadalupe Island suggest that fewer than 339 white sharks are left in the northeastern Pacific.<sup>21</sup> Reported white shark captures off the California coast indicate an increasing bycatch trend over the last decade, ranging from two to twenty-five white sharks caught annually.<sup>22</sup> In fact, of 300 reported white sharks captured in gillnet fisheries from 1936 to 2009, thirty-two percent were attributed to the Fishery.<sup>23</sup>

While the consequences of removing these top predators from oceanic food webs are unpredictable,<sup>24</sup> research has shown that the eradication of apex predators carries risks of broad ecosystem

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<sup>15</sup> WILDLIFE CONSERVATION SOC'Y, WHITE SHARK *CARCHARODON CARCHARIAS*: STATUS AND MANAGEMENT CHALLENGES, CONCLUSIONS OF THE WORKSHOP ON GREAT WHITE SHARK CONSERVATION RESEARCH 2 (2004), available at [www.cites.org/common/com/ac/20/E20-inf-01.pdf](http://www.cites.org/common/com/ac/20/E20-inf-01.pdf).

<sup>16</sup> Heidi Dewar et al., *Insights into Young of the Year White Shark*, *Carcharodon Carcharias*, *Behavior in the Southern California Bight*, in 70 ENVTL. BIOLOGY OF FISHES 133, 134 (2004), available at [www.pier.org/~pier/userdocs/images/images/photos/domeier\\_lucas\\_young\\_wht\\_shk\\_04.pdf](http://www.pier.org/~pier/userdocs/images/images/photos/domeier_lucas_young_wht_shk_04.pdf).

<sup>17</sup> WILDLIFE CONSERVATION SOC'Y, *supra* note 15, at 2.

<sup>18</sup> See Dewar et al., *supra* note 16, at 134.

<sup>19</sup> PAC. FISHERY MGMT. COUNCIL, FISHERY MANAGEMENT PLAN FOR U.S. WEST COAST FISHERIES FOR HIGHLY MIGRATORY SPECIES viii (2011), available at [www.pcouncil.org/wp-content/uploads/HMS-FMP-Jul11.pdf](http://www.pcouncil.org/wp-content/uploads/HMS-FMP-Jul11.pdf) [hereinafter *HMS FMP*].

<sup>20</sup> Dewar et al., *supra* note 16, at 134.

<sup>21</sup> SHESTER ET AL., *supra* note 3, at 5.

<sup>22</sup> *Id.* at 37.

<sup>23</sup> *Id.*

<sup>24</sup> Ransom A. Myers et al., *Cascading Effects of the Loss of Apex Predatory Sharks from a Coastal Ocean*, *SCI.*, (2007) at 1846, available at [www.fmap.ca/ramweb/papers-total/Myers\\_etal\\_2007\\_Science.pdf](http://www.fmap.ca/ramweb/papers-total/Myers_etal_2007_Science.pdf).

degradation.<sup>25</sup> Apex predators prey on many species lower in the food chain, have few natural predators, and are less abundant than their prey.<sup>26</sup> Changes in apex predator populations will likely cause cascading effects throughout trophic levels.<sup>27</sup> Removing the white shark from their habitat can exacerbate the many stresses already faced by coastal ecosystems, which will further impact countless numbers of species.<sup>28</sup>

## B. THE FISHERY

The California/Oregon Drift Gillnet Fishery is a state and federally managed fishery that uses gillnets to capture its intended targets. The Act defines a gillnet as “a panel of netting, suspended vertically in the water by floats along the top and weights along the bottom, to entangle fish that attempt to pass through it.”<sup>29</sup> Fish may be caught by becoming gilled, entangled, or enmeshed in the netting.<sup>30</sup> Gillnet fisheries off the Pacific coast employ either set gillnets or drift gillnets.<sup>31</sup>

Set gillnets use small solid floats, and their netting is made of multifilament nylon, monofilament, or multimonomofilament fibers.<sup>32</sup> Set gillnets may be used in inland waters and on the open sea, because their design accommodates fishing near the surface, in mid-water, or at the bottom.<sup>33</sup> Set gillnets are stationary or anchored to the bottom.<sup>34</sup> In contrast, drift gillnets are mobile with floats on an upper line and weights on a lower line to keep the mesh vertical.<sup>35</sup> Drift gillnets are frequently used in marine waters and kept near the surface.<sup>36</sup> These nets mostly target schooling pelagic species but can also be used to capture salmon, tuna, and pelagic squid.<sup>37</sup>

The drift gillnet fishing industry is heavily regulated by the federal

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<sup>25</sup> *Id.*

<sup>26</sup> NOAA Fisheries Fact Sheet, *White Shark*, NAT’L OCEANIC & ATMOSPHERIC ADMIN., [www.nmfs.noaa.gov/sharks/FS\\_white.htm](http://www.nmfs.noaa.gov/sharks/FS_white.htm) (last visited Apr. 10, 2013).

<sup>27</sup> WILDEARTH GUARDIANS, *supra* note 8, at 8.

<sup>28</sup> Myers et al., *supra* note 24, at 1849-50.

<sup>29</sup> 50 C.F.R. § 600.10 (Westlaw 2013).

<sup>30</sup> *Fishing Gear Types: Gillnets and Entangling Nets*, FOOD & AGRIC. ORG. OF THE UNITED NATIONS, [www.fao.org/fishery/geartype/107/en](http://www.fao.org/fishery/geartype/107/en) (last updated Sept. 13, 2001).

<sup>31</sup> NATIONAL BYCATCH REPORT, *supra* note 2, at 345.

<sup>32</sup> *Set Fishing Gear Types: Set Gillnets*, FOOD & AGRIC. ORG. OF THE UNITED NATIONS, [www.fao.org/fishery/geartype/219/en](http://www.fao.org/fishery/geartype/219/en) (last updated Sept. 13, 2001).

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

<sup>35</sup> *Fishing Gear Types: Driftnets*, FOOD & AGRIC. ORG. OF THE UNITED NATIONS, [www.fao.org/fishery/geartype/220/en](http://www.fao.org/fishery/geartype/220/en) (last updated Sept. 13, 2001).

<sup>36</sup> *Id.*

<sup>37</sup> *Id.*

government and by the states of California and Oregon.<sup>38</sup> Drift gillnets are currently illegal in the state of Washington.<sup>39</sup> Most drift gillnets are used off the California coast, with a small fraction being used off the Oregon coast.<sup>40</sup> The current fishery management plan for highly migratory species<sup>41</sup> fisheries off the West Coast requires drift gillnets to have a minimum stretched mesh size of fourteen inches in order to minimize potential problems for preventable bycatch, protected species interactions, and competition with new highly migratory species fisheries using small mesh gillnet.<sup>42</sup>

The Fishery primarily targets swordfish and common thresher sharks.<sup>43</sup> It also retains for commercial purposes mako shark, opah, and tunas.<sup>44</sup> Blue shark and common mola are among the listed bycatch, while cetaceans, pinnipeds, and sea turtles are listed under incidental takes.<sup>45</sup> The Fishery is closed within 200 miles of the coasts of California and Oregon from February 1 to April 30.<sup>46</sup> On May 1 the closure is reduced to seventy-five miles offshore.<sup>47</sup> All closure restrictions are lifted from August 15 through January 31.<sup>48</sup> The majority of fishing effort takes place from October through December, which parallels the white shark's migratory patterns.<sup>49</sup> Additionally, most of the Fishery's fishing effort occurs in the Southern California Bight, which is recognized as an important nursery and feeding area for white sharks.<sup>50</sup>

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<sup>38</sup> *Highly Migratory Species: Background*, PAC. FISHERY MGMT. COUNCIL, [www.pcouncil.org/highly-migratory-species/background/](http://www.pcouncil.org/highly-migratory-species/background/) (last modified Nov. 20, 2012) [hereinafter *HMS: Background*].

<sup>39</sup> *Id.*

<sup>40</sup> *Id.*

<sup>41</sup> Highly migratory species include oceanic shark, swordfish, sailfish, marlin, and tuna species. 16 U.S.C.A. § 1802(21) (Westlaw 2013).

<sup>42</sup> HMS FMP, *supra* note 19, at 56.

<sup>43</sup> *California/Oregon Drift Gillnet Fishery*, *supra* note 1.

<sup>44</sup> *Id.*

<sup>45</sup> *Id.*

<sup>46</sup> *Id.*

<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

<sup>49</sup> *Id.*

<sup>50</sup> NAT'L MARINE FISHERIES SERV., ENVIRONMENTAL ASSESSMENT FOR THE INTERIM FINAL RULE TO IMPLEMENT THE REASONABLE AND PRUDENT ALTERNATIVE IN THE BIOLOGICAL OPINION RELATED TO THE CALIFORNIA/OREGON DRIFT GILLNET FISHERY 36 (2001), available at [swr.nmfs.noaa.gov/psd/DriftGillnetRPAFinalE.PDF](http://swr.nmfs.noaa.gov/psd/DriftGillnetRPAFinalE.PDF); see Dewar et al., *supra* note 16, at 134.

### III. WHITE SHARK BYCATCH LAW

#### A. BASIC STRUCTURE OF THE FISHERY REGULATORY HIERARCHY

Under the Act, the Secretary of Commerce has the authority to regulate federal fisheries.<sup>51</sup> The Secretary delegates those duties to the Fisheries Service, a division within the Department of Commerce's National Oceanic and Atmospheric Administration.<sup>52</sup> The Fisheries Service ensures that fisheries are compliant with federal regulations and works to minimize wasteful fishing practices.<sup>53</sup> Enforcement of the Act has been delegated to the United States Coast Guard and a few federal agencies authorized by the Secretary, including the Fisheries Service.<sup>54</sup>

Eight regional fishery management councils were created by the Act, with the Pacific Fishery Management Council (Council) having authority over Pacific Ocean fisheries along the states of California, Oregon, and Washington, including the Fishery.<sup>55</sup> The Council makes recommendations to the Fisheries Service regarding effective management measures, which are then implemented by the Fisheries Service's regional office.<sup>56</sup>

Within the Fisheries Service is the Southwest Fisheries Science Center, which is one of six nationwide fishery research centers responsible for gathering the scientific information needed to effectively conserve and manage living marine resources.<sup>57</sup> The Center analyzes data retrieved from along the West Coast and throughout the Pacific, and it works in conjunction with the Fisheries Service's regional offices and state agencies to collect relevant fishery data.<sup>58</sup> Additionally, it supports the Council by providing scientific advice based on evaluations and stock assessment.<sup>59</sup>

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<sup>51</sup> 16 U.S.C.A. § 1854 (Westlaw 2013).

<sup>52</sup> See *About National Marine Fisheries Service*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., [www.nmfs.noaa.gov/aboutus/aboutus.html](http://www.nmfs.noaa.gov/aboutus/aboutus.html) (last visited Apr. 10, 2013).

<sup>53</sup> *Id.*

<sup>54</sup> 16 U.S.C.A. § 1861(a) (Westlaw 2013).

<sup>55</sup> 16 U.S.C.A. § 1852 (Westlaw 2013).

<sup>56</sup> *Who We Are and What We Do*, PAC. FISHERY MGMT. COUNCIL, [www.pcouncil.org](http://www.pcouncil.org) (last visited Apr. 10, 2013).

<sup>57</sup> *Mission and Overview*, SW. FISHERIES SCI. CTR., [swfsc.noaa.gov/textblock.aspx?id=993&ParentMenuId=6](http://swfsc.noaa.gov/textblock.aspx?id=993&ParentMenuId=6) (last modified Jan. 24, 2013).

<sup>58</sup> *Id.*

<sup>59</sup> *Id.*



## B. THE MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT

Congress, in passing the Act, determined that fish off the United States coasts and highly migratory species of the high seas<sup>60</sup> are valuable natural resources.<sup>61</sup> Congress recognized that certain stocks of fish have declined to the point where survival is threatened as a direct result of increased fishing pressures, the inadequacy of fishery resource conservation and management practices, and the loss of habitat.<sup>62</sup> Although commercial fishing is a major source of employment and contributes to the economy of the United States, overfishing presents a significant threat not only to targeted species, but also to species that are caught incidentally.<sup>63</sup>

The Act was designed to govern the conservation and management<sup>64</sup> of fishery resources off the coasts of the United States, and is the leading federal statute addressing white shark bycatch.<sup>65</sup> The United States claims sovereign rights and exclusive fishery management authority over all fish within the exclusive economic zone.<sup>66</sup> The Act defines bycatch as “fish which are harvested in a fishery, but which are not sold or kept for personal use, . . . includ[ing] economic discards and regulatory discards.”<sup>67</sup>

Additionally, the Act sets forth ten national standards that federally managed fisheries must follow when preparing fishery management plans (FMPs) and promulgating regulations. National Standard Nine requires that “[c]onservation and management measures shall, to the extent practicable, . . . minimize bycatch and . . . to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.”<sup>68</sup> When it is not practicable to eliminate all bycatch, bycatch must be carefully monitored to ensure that it occurs in a sustainable manner.<sup>69</sup> The Act

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<sup>60</sup> The high seas include all waters beyond the territorial sea of the United States and beyond any foreign nation's territorial sea recognized by the United States. 16 U.S.C.A. § 1802(20) (Westlaw 2013).

<sup>61</sup> 16 U.S.C.A. § 1801(a)(1) (Westlaw 2013).

<sup>62</sup> 16 U.S.C.A. § 1801(a)(2) (Westlaw 2013).

<sup>63</sup> 16 U.S.C.A. § 1801(a)(3) (Westlaw 2013).

<sup>64</sup> “Conservation and management” refers to all rules and regulations that are required to restore any fishery resource and the marine environment, and that are designed to assure that irreversible or long-term adverse effects on fishery resources and the marine environment are avoided. 16 U.S.C.A. § 1802(5) (Westlaw 2013).

<sup>65</sup> 16 U.S.C.A. § 1801(b)(1) (Westlaw 2013).

<sup>66</sup> 16 U.S.C.A. § 1811(a) (Westlaw 2013).

<sup>67</sup> 16 U.S.C.A. § 1802(2) (Westlaw 2013).

<sup>68</sup> 16 U.S.C.A. § 1851(a)(9) (Westlaw 2013).

<sup>69</sup> *National Bycatch Strategy*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. FISHERIES, [www.nmfs.noaa.gov/bycatch/bycatch\\_strategy.htm](http://www.nmfs.noaa.gov/bycatch/bycatch_strategy.htm) (last visited Apr. 10, 2013).

expands on the requirement of conservation and management measures, by adding that FMPs are required to “establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery.”<sup>70</sup> Additionally, the Secretary is obligated to establish advisory guidelines, which do not have the force of law, to assist in the development of FMPs.<sup>71</sup>

The Act also establishes eight regional fishery management councils. Each council is responsible for developing FMPs and management measures for the fisheries within the exclusive economic zone of its constituent states.<sup>72</sup> FMPs are then approved and implemented by the Fisheries Service.<sup>73</sup> FMPs are required to contain conservation and management measures necessary and appropriate to prevent overfishing and rebuild overfished stocks.<sup>74</sup>

Additionally, each FMP is required to specify objective and measurable criteria for identifying when the fishery is overfished, with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery.<sup>75</sup> The FMP must establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and it must include measures that minimize bycatch and the mortality of bycatch that cannot be avoided.<sup>76</sup> Any FMP may implement a system of incentives to reduce total bycatch including (1) measures to incorporate bycatch into individual quotas, (2) measures to promote the use of gear with verifiable and monitored low bycatch rates, and (3) measures that will reduce bycatch interactions, bycatch mortality, and regulatory discards in the fishery.<sup>77</sup>

The Act is also important because it establishes the authority to implement observer programs.<sup>78</sup> Observers are trained biologists who perform one or more monitoring tasks that assist with the management of the fishery, either from a scientific or regulatory standpoint, from on board fishing vessels.<sup>79</sup> Such monitoring tasks include catch/effort

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<sup>70</sup> 16 U.S.C.A. § 1853(a)(11) (Westlaw 2013).

<sup>71</sup> 16 U.S.C.A. § 1851(b) (Westlaw 2013).

<sup>72</sup> *Regional Fishery Management Councils*, OFFICE OF SUSTAINABLE FISHERIES, REG’L FISHERY MGMT. COUNCILS, [www.nmfs.noaa.gov/sfa/reg\\_svcs/councils.htm](http://www.nmfs.noaa.gov/sfa/reg_svcs/councils.htm) (last visited Apr. 10, 2012).

<sup>73</sup> *Id.*

<sup>74</sup> 16 U.S.C.A. § 1853(a)(1) (Westlaw 2013).

<sup>75</sup> 16 U.S.C.A. § 1853(a)(10) (Westlaw 2013).

<sup>76</sup> 16 U.S.C.A. § 1853(a)(11) (Westlaw 2013).

<sup>77</sup> 16 U.S.C.A. § 1865(b) (Westlaw 2013).

<sup>78</sup> 16 U.S.C.A. § 1881b (Westlaw 2013).

<sup>79</sup> GRAEME PARKES & MARK S. KAISER, NMFS FISHERIES OBSERVER COVERAGE LEVEL WORKSHOP: DEFINING A BASIS 3 (2004), *available at*

monitoring, bycatch monitoring, protected species monitoring, technical monitoring, and compliance monitoring.<sup>80</sup> In addition to the standard monitoring tasks, observers may also collect information on gear used, vessel type, fishing techniques, fishing effort, gear characteristics, environmental conditions, and in certain fisheries, economic information.<sup>81</sup> The wide range of information collected by observers is useful in analyzing life history and studying fish behavior.<sup>82</sup> Observer data is used with information collected from other methods, such as self-reported logbooks and landings receipts, to estimate the relative abundance of bycatch species.<sup>83</sup>

The Act provides four remedies for violations. First, any officer authorized to enforce the Act may issue a citation if the officer finds that a fishing vessel has been in violation of any provision of the Act.<sup>84</sup> Second, any person found to have committed a prohibited act is liable for a civil penalty.<sup>85</sup> Third, any fishing vessel used and any fish taken, in any manner that is prohibited by the Act, are subject to judicial forfeiture.<sup>86</sup> Fourth, violators can be subject to criminal prosecution.<sup>87</sup>

#### C. HIGHLY MIGRATORY SPECIES FISHERY MANAGEMENT PLAN

The Fisheries Service approved the Council's Highly Migratory Species Fishery Management Plan for United States West Coast fisheries in February 2004.<sup>88</sup> The Plan governs commercial fishing of highly migratory species in the United States exclusive economic zone off the coasts of Washington, Oregon, and California and in adjacent high seawaters, by instituting conservation and management measures for the fisheries.<sup>89</sup> As of 2005, highly migratory species fisheries are required to obtain permits from the Fisheries Service and maintain logbooks documenting their catches.<sup>90</sup> If requested by the Fisheries Service, a

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[www.nmfs.noaa.gov/by\\_catch/CoverageWorkshopFinalRevised.pdf](http://www.nmfs.noaa.gov/by_catch/CoverageWorkshopFinalRevised.pdf).

<sup>80</sup> *Id.*

<sup>81</sup> NAT'L MARINE FISHERIES SERV., EVALUATING BYCATCH: A NATIONAL APPROACH TO STANDARDIZED BYCATCH MONITORING PROGRAMS 34 (2004), available at [www.nmfs.noaa.gov/by\\_catch/SPO\\_final\\_rev\\_12204.pdf](http://www.nmfs.noaa.gov/by_catch/SPO_final_rev_12204.pdf) [hereinafter *Evaluating Bycatch*].

<sup>82</sup> *Id.*

<sup>83</sup> *Id.*

<sup>84</sup> 16 U.S.C.A. § 1861 (Westlaw 2013).

<sup>85</sup> 16 U.S.C.A. § 1858 (Westlaw 2013).

<sup>86</sup> 16 U.S.C.A. § 1860 (Westlaw 2013).

<sup>87</sup> 16 U.S.C.A. § 1859 (Westlaw 2013).

<sup>88</sup> *HMS: Background*, *supra* note 38.

<sup>89</sup> 50 C.F.R. § 660.701 (Westlaw 2013).

<sup>90</sup> *HMS: Background*, *supra* note 38.

vessel must carry a fishery observer.<sup>91</sup> These measures are intended to improve data collection regarding highly migratory species catches.<sup>92</sup>

The Plan designates some species, like the white shark, as prohibited targets.<sup>93</sup> If a fishery pursuing highly migratory species incidentally catches a prohibited species, the fishery must release it immediately.<sup>94</sup> The prohibition is intended to discourage intentional catch and to reduce fishing mortality.<sup>95</sup> The Council has specifically recognized that sharks are especially vulnerable to overfishing because of their biology, behavior, and history of exploitation.<sup>96</sup> Moreover, with regard to the northeastern Pacific white shark, the potential local depletion is of special concern.<sup>97</sup> Additionally, the Council has acknowledged that improved data collection is needed in order to effectively manage highly migratory species.<sup>98</sup>

Many of the Plan's provisions are intended to improve monitoring and reporting in fisheries.<sup>99</sup> For example, any vessel that fishes for highly migratory species off the coast, or that lands highly migratory species, must be registered for use under a highly migratory species permit that authorize the targeting of such species as well as the use of specific gear, such as drift gillnets.<sup>100</sup> Not all highly migratory species fisheries that have been issued permits are required to accommodate observers,<sup>101</sup> but if a vessel is required to accommodate an observer, the vessel cannot fish without an observer.<sup>102</sup>

#### IV. RECOMMENDATIONS: THE FUTURE OF WHITE SHARK BYCATCH

White shark bycatch has been recognized as a key threat to the recovery of the northeastern Pacific white shark population. Therefore, the most effective way to increase white shark survival is to reduce white shark bycatch numbers by adopting a three-fold approach. First, the Act should be amended to enhance current protections that are already in place. Second, additional changes should be made to the Plan to further reduce white shark bycatch at the fishery level. Third, research efforts

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<sup>91</sup> *Id.*

<sup>92</sup> *Id.*

<sup>93</sup> 50 C.F.R. § 660.711 (Westlaw 2013).

<sup>94</sup> *Id.*

<sup>95</sup> *HMS: Background*, *supra* note 38.

<sup>96</sup> *Id.*

<sup>97</sup> *Id.*

<sup>98</sup> *Id.*

<sup>99</sup> *Id.*

<sup>100</sup> 50 C.F.R. § 660.707(a) (Westlaw 2013).

<sup>101</sup> 50 C.F.R. § 660.719(a) (Westlaw 2013).

<sup>102</sup> 50 C.F.R. § 660.719(d) (Westlaw 2013).

should be increased in order to gain a better understanding of white shark bycatch and the northeastern Pacific white shark population in general.

#### A. MODIFICATIONS TO THE MAGNUSON-STEVENSON ACT

At this time, the United States Coast Guard and the few federal agencies authorized by the Secretary of Commerce are the only entities capable of enforcing the provisions of the Act.<sup>103</sup> The Coast Guard has two district offices, located in Seattle, Washington, and Alameda, California, which together cover the entire jurisdiction of the Fishery.<sup>104</sup> But the majority of white sharks that have been incidentally taken are primarily located in the Southern California Bight, nearly 350 miles south of the nearest district office. In order for fisheries to be effectively enforced, a strong at-sea presence is necessary.<sup>105</sup> However, expecting the Coast Guard to effectively monitor bycatch violations in the Fishery is not realistic.

Currently, citizens may challenge an agency action under the Administrative Procedure Act. Yet, the likelihood of succeeding is minimal, due to the stringent standard that citizens must meet to prevail.<sup>106</sup> With only the Coast Guard and limited governmental oversight to enforce the Act, the effectiveness of protecting white sharks from bycatch is questionable. There needs to be an additional incentive for fisheries to comply with the existing statutes.

The Act could be strengthened and more effectively enforced by adding a citizen suit provision. This provision would authorize private persons to commence civil actions against those who have violated the Act. Citizen suits have been used effectively in other areas of environmental law, especially for endangered species through the ESA. The ESA citizen suit provision currently provides three options for citizens to enforce the ESA. First, individuals may sue to enjoin any person, including the United States and any other government agency, that is alleged to be in violation of the ESA or any regulation issued under the ESA.<sup>107</sup> Second, individuals may compel the Secretary to apply the prohibitions listed in the ESA.<sup>108</sup> Third, individuals may bring an action against the Secretary for failure to perform any

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<sup>103</sup> 16 U.S.C.A. § 1861(a) (Westlaw 2013).

<sup>104</sup> *Units*, U.S. COAST GUARD, [www.uscg.mil/top/units/](http://www.uscg.mil/top/units/) (last modified Jan. 26, 2012).

<sup>105</sup> Matthew Jones, *Enforcement of U.S. Fisheries Laws in the EEZ: An Illustration of the Value of the Coast Guard's Deepwater Missions to the Nation and the Need To Provide It with Adequate Deepwater Resources*, 13 OCEAN & COASTAL L. J. 281, 285 (2008).

<sup>106</sup> 5 U.S.C.A. § 706 (Westlaw 2013).

<sup>107</sup> 16 U.S.C.A. § 1540(g)(1)(A) (Westlaw 2013).

<sup>108</sup> 16 U.S.C.A. § 1540(g)(1)(B) (Westlaw 2013).

nondiscretionary act or duty.<sup>109</sup>

To provide the white shark better protection, the Act should be amended to include a citizen suit provision similar to the ESA citizen suit provision. In enacting the ESA, Congress acknowledged that certain species “have been so depleted in numbers that they are in danger of or threatened with extinction.”<sup>110</sup> Similarly, Congress has recognized in the Act that “[c]ertain stocks of fish have declined to the point where their survival is threatened, and other stocks of fish have been so substantially reduced in number that they could become similarly threatened as a consequence of . . . the inadequacy of fishery resource conservation and management practices and controls.”<sup>111</sup> Since the goals of both the ESA and the Act are to protect species from becoming extinct, the ESA citizen suit provision is well-suited for protecting the white shark. Therefore, the Act’s citizen suit provision should be modeled after the ESA citizen suit provision.

#### B. IMPROVEMENTS TO THE HIGHLY MIGRATORY SPECIES FISHERY MANAGEMENT PLAN

There are two ways that the Plan could be altered to improve protection of white sharks from bycatch. First, the Plan should heighten observer coverage to produce more accurate and reliable information. Second, the Fishery could employ electronic monitoring to improve monitoring where observer coverage is lacking.

##### 1. *Heightened Observer Coverage*

In order for bycatch reduction strategies to be successful, the information obtained must be accurate and reliable.<sup>112</sup> In many cases, bycatch cannot be measured without at least some measurement error, because eliminating all errors is neither physically nor economically feasible.<sup>113</sup> These errors stem from considerations such as funding, costs, safety, and logistical constraints.<sup>114</sup> “The reliability of the resulting bycatch estimates is then gauged by such factors as the precision and

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<sup>109</sup> 16 U.S.C.A. § 1540(g)(1)(C) (Westlaw 2013).

<sup>110</sup> 16 U.S.C.A. § 1531(a)(2) (Westlaw 2013).

<sup>111</sup> 16 U.S.C.A. § 1801(a)(2) (Westlaw 2013).

<sup>112</sup> See ELIZABETH A. BABCOCK & ELLEN K. PIKITCH, HOW MUCH OBSERVER COVERAGE IS ENOUGH TO ADEQUATELY ESTIMATE BYCATCH? 5 (2004), available at [www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Protecting\\_ocean\\_life/oceana\\_bycatch\\_110403.pdf](http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Protecting_ocean_life/oceana_bycatch_110403.pdf).

<sup>113</sup> EVALUATING BYCATCH, *supra* note 81, at 34.

<sup>114</sup> *Id.*

accuracy of the estimates.”<sup>115</sup> The precision of an estimate is based upon factors such as sample size, fishery size, and bycatch variability.<sup>116</sup> “The accuracy of an estimate depends on these three measurements as well as whether the sampled part of the fishery is representative of the entire fishery.”<sup>117</sup>

The most efficient method of monitoring fisheries and collecting reliable bycatch data is through comprehensive observer programs.<sup>118</sup> In some cases, particularly those involving endangered species, 100 percent observer coverage is necessary.<sup>119</sup> However, when complete observer coverage is unattainable, the coverage level implemented must be precise and accurate enough to sufficiently estimate total bycatch numbers.<sup>120</sup>

It is important to have an exact count of the mortalities caused by bycatch, particularly in cases such as the white shark, where each death has drastic effects that jeopardize the recovery of a threatened or endangered species.<sup>121</sup> There have been cases in which 100 percent observer coverage has been required in United States fisheries.<sup>122</sup> In these cases, the heightened amount of coverage was due to the fisheries’ interactions with endangered species.<sup>123</sup>

Bias can occur any time observer coverage is less than 100 percent.<sup>124</sup> Efforts to address bycatch problems are meaningless unless bias is eliminated from the reporting process to the greatest extent possible. The Fishery has been identified as a fishery where some vessel-selection bias exists.<sup>125</sup> Bias occurs any time observed areas are not representative of the fishery as a whole.<sup>126</sup> “Observer samples will not be representative of the fishery if, for example, (1) bycatch rates change when observers are on board, (2) voluntary vessel participants have different bycatch rates than nonparticipants, or (3) logistical constraints are related to bycatch rates.”<sup>127</sup> Other sources of bias include inaccurate

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<sup>115</sup> *Id.*

<sup>116</sup> BABCOCK & PIKITCH, *supra* note 112, at 5.

<sup>117</sup> *Id.*

<sup>118</sup> See MARINE FISH CONSERVATION NETWORK, TURNING A BLIND EYE: THE “SEE NO EVIL” APPROACH TO WASTEFUL FISHING 4 (2006), available at [cdn.publicinterestnetwork.org/assets/KmxuhzmbziLqGZoY5sKKqA/BycatchReport.pdf](http://cdn.publicinterestnetwork.org/assets/KmxuhzmbziLqGZoY5sKKqA/BycatchReport.pdf).

<sup>119</sup> BABCOCK & PIKITCH, *supra* note 112, at 4.

<sup>120</sup> *Id.* at 5.

<sup>121</sup> See *id.* at 4.

<sup>122</sup> *Id.*

<sup>123</sup> *Id.* For example, 100 percent coverage was required in an “Atlantic shark gillnet fishery, during times of the year when right whales [were] calving.” *Id.*

<sup>124</sup> *Id.* at 5.

<sup>125</sup> NATIONAL BYCATCH REPORT, *supra* note 2, at 359.

<sup>126</sup> BABCOCK & PIKITCH, *supra* note 112, at 6.

<sup>127</sup> *Id.*

reporting by observers, the use of small sample sizes, inappropriate stratification,<sup>128</sup> and non-random allocation of sampling efforts.<sup>129</sup>

Any vessel operating in highly migratory species fisheries off the West Coast may be required to carry an observer.<sup>130</sup> This applies to all fishing vessels with permits, including catcher/processors, at-sea processors, and vessels that embark from ports in Washington, Oregon, or California and land catch in another area.<sup>131</sup> The Fisheries Service has discretionary power to decide when observers should be used. If selected, a vessel is required to carry an observer.<sup>132</sup>

Since 1990, the Fishery has been required to have twenty percent observer coverage.<sup>133</sup> However, the Fishery has recently failed to satisfy the mandated coverage level. From 2005 to 2007, the Fishery was able to maintain a coverage level of twenty percent.<sup>134</sup> But in 2008 the coverage level fell between thirteen and fourteen percent.<sup>135</sup> Coverage levels for other years were not available.<sup>136</sup> The Fisheries Service suggested that the coverage level for the Fishery be increased to at least thirty percent.<sup>137</sup> The Fishery should follow the recommendation made by the Fisheries Service and increase observer coverage to thirty percent, to ensure that the information obtained regarding white shark bycatch is more accurate and reliable.

## 2. *Electronic Monitoring*

While observer programs are the most effective means to estimate bycatch, a major concern is the high cost of implementing these types of programs.<sup>138</sup> Because observer programs are expensive, their use has typically been limited to fisheries with known or suspected high levels of bycatch.<sup>139</sup> This creates gaps in knowledge where bycatch may be occurring but is not documented.<sup>140</sup> Additionally, inconsistencies in funding each year can affect sampling efforts, create uneven data sets,

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<sup>128</sup> *Id.* Observer samples are usually stratified by quarter, gear type, fishing area, and other factors, thus increasing the precision of total bycatch estimates for a given coverage level. *Id.* at 10.

<sup>129</sup> *Id.* at 6.

<sup>130</sup> 50 C.F.R. § 660.719(a) (Westlaw 2013).

<sup>131</sup> *Id.*

<sup>132</sup> 50 C.F.R. § 660.719(d) (Westlaw 2013).

<sup>133</sup> NATIONAL BYCATCH REPORT, *supra* note 2, at 349.

<sup>134</sup> *Id.*

<sup>135</sup> *Id.*

<sup>136</sup> *Id.*

<sup>137</sup> *Id.* at 359.

<sup>138</sup> EVALUATING BYCATCH, *supra* note 81, at 39.

<sup>139</sup> *Id.* at 40.

<sup>140</sup> *Id.*



and introduce additional sources of bias.<sup>141</sup>

If observer coverage is impracticable, then alternative means should be implemented to achieve desired coverage levels. One such alternative is an electronic monitoring (EM) system. EM systems are cost-effective and efficient alternatives that have been used in various monitoring applications over the past twenty years.<sup>142</sup> The systems use commercially available components that can be placed on vessels where observers cannot be accommodated.<sup>143</sup> A key advantage of EM is that it creates a permanent data record, which provides a great deal of flexibility in reviewing the information.<sup>144</sup> The Fisheries Service recommended that the Fishery implement a pilot EM program to reduce coverage biases.<sup>145</sup> The Fishery should follow the Fisheries Service's recommendation and institute EM systems to obtain accurate and reliable information and effectively monitor white shark bycatch.

EM effectiveness depends on several factors, such as fishing method, catch quantity, handling practices, number of cameras, and camera quality.<sup>146</sup> Gillnet fisheries receive their catch aboard in a serial manner.<sup>147</sup> Multiple cameras can be placed on the outboard of the hauling station, which will provide a close-up view of most catch items as they move through the view area, as well as a wide-angle view of the entire retrieval area.<sup>148</sup> Generally, retrieval rates for gillnet fishing vessels are slow, which allows for easier identification of most catch items.<sup>149</sup> This approach will provide an effective way of achieving desired coverage levels and adequately protect threatened species when comprehensive observer coverage is not feasible.

EM, however, is not without some pitfalls. There are concerns regarding the application of EM, including the confidentiality of images collected and the increased potential for lawsuits if video monitoring records injuries or other mishaps.<sup>150</sup> In order to effectively use EM systems, policies and procedures for the disposition of electronic images must be established.<sup>151</sup> Only then can the Fisheries Service proceed with

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<sup>141</sup> *Id.*

<sup>142</sup> HOWARD MCELDERRY, AT-SEA OBSERVING USING VIDEO-BASED ELECTRONIC MONITORING 3 (July 29-30, 2008), available at [www.afma.gov.au/wp-content/uploads/2010/06/EM\\_Videobased\\_07.pdf](http://www.afma.gov.au/wp-content/uploads/2010/06/EM_Videobased_07.pdf).

<sup>143</sup> *Id.*

<sup>144</sup> *Id.* at 10.

<sup>145</sup> NATIONAL BYCATCH REPORT, *supra* note 2, at 8.

<sup>146</sup> MCELDERRY, *supra* note 142, at 15.

<sup>147</sup> *Id.*

<sup>148</sup> *Id.*

<sup>149</sup> *Id.*

<sup>150</sup> EVALUATING BYCATCH, *supra* note 81, at 43.

<sup>151</sup> *Id.*

full implementation of EM programs.<sup>152</sup>

### C. IMPROVING RESEARCH EFFORTS

Over the past fifteen years there has been significant increase in research regarding the threat of bycatch in the United States. In 1998, the Fisheries Service created a comprehensive national bycatch plan.<sup>153</sup> In 2003, the agency created the national bycatch strategy, which set the stage for a comprehensive review of agency progress toward meeting national bycatch goals.<sup>154</sup> In 2004, the Fisheries Service released a report to formulate procedures for monitoring bycatch.<sup>155</sup>

In 2011, the Fisheries Service developed the National Bycatch Report (Report).<sup>156</sup> The Report provides a compilation of federal bycatch estimates for living marine resources in United States commercial fisheries, including the Fishery.<sup>157</sup> The Report separates the data into six regions, with the Fishery located in the southwest region.<sup>158</sup> Observer programs in this region concentrate primarily on marine mammal bycatch.<sup>159</sup> Data sources available for the southwest region included observer programs, self-reporting, and landing receipts.<sup>160</sup>

The Report developed a tier classification system to evaluate the quality of bycatch data and the reliability of bycatch estimation methods, ranging from Tier Zero to Tier Four, with Tier Four set as the highest available ranking and most reliable.<sup>161</sup> The fisheries were assessed based on: adequacy of bycatch data collection and self-reported logbooks; availability of supplemental data; database and information technology considerations; and quality of analytical approaches.<sup>162</sup> Tier determination was driven primarily by the adequacy of observer data and quality of analytical approaches.<sup>163</sup> The Fisheries Service classified the Fishery as a Tier Two fishery with regard to fish bycatch,<sup>164</sup> which means that bycatch estimates “would have benefited from improvements

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<sup>152</sup> *Id.*

<sup>153</sup> *National Bycatch Strategy*, *supra* note 69.

<sup>154</sup> *Id.*

<sup>155</sup> *Id.*

<sup>156</sup> *See generally* NATIONAL BYCATCH REPORT, *supra* note 2.

<sup>157</sup> *Id.* at 3.

<sup>158</sup> *See id.* at 24-37; *see also id.* at 349.

<sup>159</sup> *Id.* at 348.

<sup>160</sup> *See id.* at 348-350.

<sup>161</sup> *Id.* at 4-5.

<sup>162</sup> *See id.* at 5.

<sup>163</sup> *Id.*

<sup>164</sup> *Id.* at 351.

in data quality and/or analytical methods.”<sup>165</sup> Although bycatch estimation improvement plans have been developed for the Fishery, coverage level has yet to be increased. Until additional coverage is implemented, either by increasing observer programs or by other methods, the accuracy and reliability of data on the white shark will remain questionable.

In addition to improving research efforts to evaluate fish bycatch in the Fishery, there must be an increase in research specifically focused on the northeastern Pacific white shark population. New research should center on the species’ size, movements, and dynamics.<sup>166</sup> Research should also be aimed at identifying the northeastern Pacific population’s abundance and population trends.<sup>167</sup> Lastly, there should be a greater focus on genetic research, because it is essential to have a more comprehensive understanding of the white shark.<sup>168</sup> By conducting further research on the white shark and improving the evaluation of fish bycatch in the Fishery, lawmakers will be able to implement effective conservation and management measures that will better protect the white shark.

## V. CONCLUSION

Bycatch in the California/Oregon Drift Gillnet Fishery continues to be a clear and significant threat to the white shark. The most effective way to reduce white shark bycatch numbers and increase white shark survival is to adopt a three-fold approach. First, the Magnuson-Stevens Fishery Conservation and Management Act should be amended to grant citizens the ability to enforce the provisions of the Act through legal action by adding a citizen suit provision. Second, the Highly Migratory Species Fishery Management Plan for the Fishery should be modified to increase observer coverage levels where practicable. If additional observer coverage is not attainable, then electronic monitoring systems should be implemented to achieve desired coverage levels. Third, data collection of white shark bycatch estimates should be improved, and research efforts should be increased regarding the abundance, population trends, and characteristics of the northeastern Pacific white shark. This three-prong approach is proposed in order to implement effective conservation and management measures that will better protect the white shark. Only then can the white shark population recover from the threat

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<sup>165</sup> *Id.* at 5.

<sup>166</sup> SHESTER ET AL., *supra* note 3, at 45.

<sup>167</sup> *Id.*

<sup>168</sup> *Id.*

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of extinction and continue to enjoy its unique and important position as  
an apex predator in the aquatic ecosystem.